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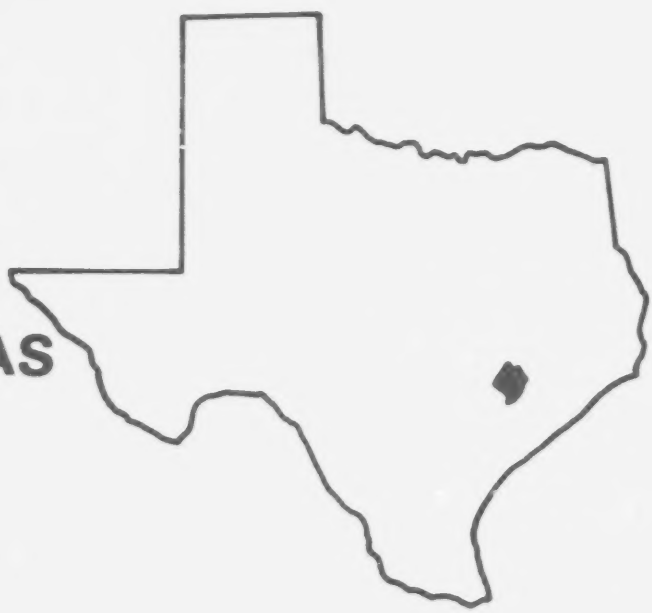
FLOOD INSURANCE STUDY

COLORADO COUNTY, TEXAS AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
COLUMBUS, CITY OF	480145
EAGLE LAKE, CITY OF	480146
WEIMAR, CITY OF	481121
UNINCORPORATED AREAS	480144

JANUARY 3, 1990

Federal Emergency Management Agency

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Countywide Flood Insurance Study Effective Date: January 3, 1990

Flood Insurance Study Revised:

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FLOOD INSURANCE STUDY
COLORADO COUNTY AND INCORPORATED AREAS, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the geographic area of Colorado County, Texas, including the Cities of Eagle Lake, Columbus, and Weimar; and the unincorporated areas of Colorado County (hereinafter referred to collectively as Colorado County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Army Corps of Engineers (COE) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-87-E-2509, Project Order No. 11. This work was completed in April 1987.

1.3 Coordination

On May 22, 1986, an Initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the county, and the COE (the study contractor) to determine the streams to be studied by detailed methods.

On January 17, 1989, a final CCO meeting was held with representatives of FEMA, the county, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the geographic area of Colorado County, Texas. The area of study is shown on the Vicinity Map (Figure 1).

The Colorado River was studied by detailed methods from a point approximately 2.2 miles downstream of Interstate Route 10 to a point approximately 20 miles upstream. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through April 1992.

The following flooding sources were studied by approximate methods: Cummins Creek, Clear Creek, Bull Creek, West Sandy Creek, Stein Branch, Harvey Creek, Boggy Creek, Skull Creek, Poplar Creek, Middle Fork, Brush Creek, South Fork, Piper Creek, Jones Creek, Yupon Creek, Sandy Creek, Snyder Branch, Church Creek, Crier Creek, Coushatta Creek, Hobson Branch, Mineral Branch, Redgate Creek, Allen Branch, Plum Branch, Zimmer Creek, Middle Bernard Creek, Dry Creek, Goldenrod Creek, Bee Branch, Gum Tree Branch, Piney Creek, Cottonwood Creek, Hayes Creek, McKinnon Branch, the Little San Bernard River, Miller Creek, Schmitt Creek, Dowdy Creek, Willow Creek, West Fork Middle Sandy Creek, the San Bernard River, the East Navidad River, Griffin Lake, Eagle Lake, McKenzie Creek, Lower Lake, West Bernard Creek, Dewberry Branch, Sawmill Branch, Parker Creek, Big Sandy Branch, Urmey Branch, Middle Sandy Creek, West Fork Middle Sandy Creek, East Fork Middle Sandy Creek, Lake Sheridan, East Sandy Creek, Bucksnag Creek, Pinoak Creek, Jack Branch, Crasco Branch, Little Crasco Creek, Gum Branch, Muddy Lake, Coppers Creek, Lost Fork Goldenrod Creek, West Turkey Creek, and the remaining portions of the Colorado River. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Colorado County.

2.2 Community Description

Colorado County is located in southeast Texas, approximately 70 miles west of Houston. It is bordered by the unincorporated areas of Austin County to the northeast, the unincorporated areas of Wharton County to the southeast, the unincorporated areas of Lavaca and Jackson Counties to the southwest, and the unincorporated areas of Fayette County to the northwest. Colorado County has an area of 964 square miles, of which 97 percent is classified as farmland. The City of Columbus is the county seat. The population was at its highest in 1900, when it was 22,203; and dropped to 18,897 in 1910. Since that time, the population has remained relatively stable, remaining within 7 percent of the 1910 figure. The population was 19,500 in 1982 (Reference 1).

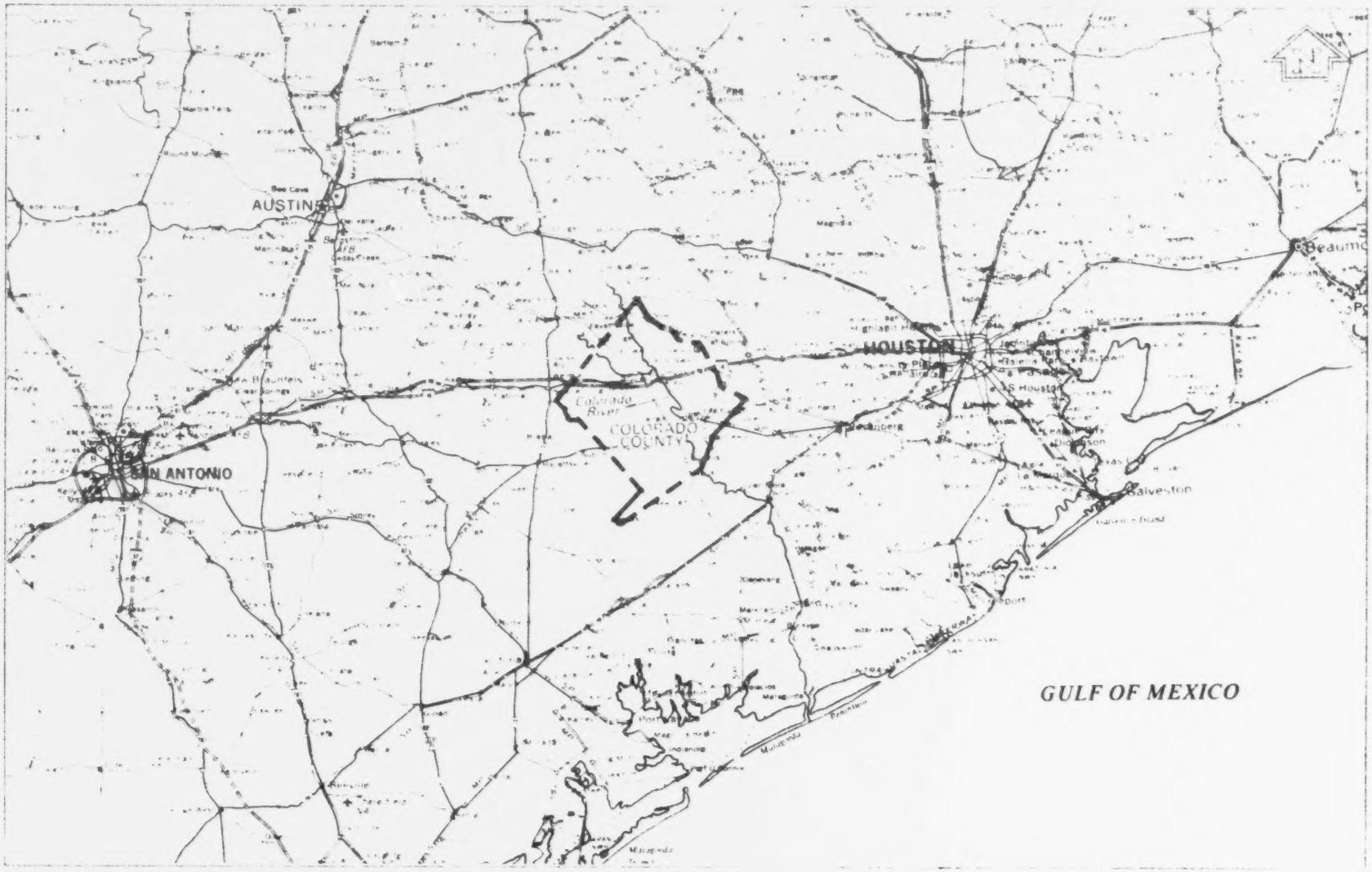


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLORADO COUNTY, TX AND INCORPORATED AREAS

APPROXIMATE SCALE

30 0 30 60 90 MILES

VICINITY MAP

Colorado County is bisected by the Colorado River, the largest river in the state if measured by length or watershed area. The county lies in the region of Texas known as the Gulf Coastal Plain, which consists mainly of recent and late Pleistocene alluvial and deltaic plains of the Colorado, Brazos, Trinity, Neches, and Sabine Rivers (Reference 2). The region slopes gently toward the southeast and is relatively featureless except for entrenched river valleys, some with associated embayments. The Gulf Coastal Plain contains isolated salt domes and some of the most important petroleum producing and processing areas in the state.

The soils of Colorado County feature dark-colored, limy, crumbly clays of the Lake Charles, Beaumont, Harris, Hockley, and Edna series. The area enjoys rainfall, climate, and growing season adequate for varied agricultural pursuits. The growing season is 280 days, and average annual precipitation is 41.3 inches. Native plant life categorizes Colorado County as being mainly in the Post Oak Belt, which features, along with a variety of oaks; elm, pecan, walnut, and other water-demanding trees.

2.3 Principal Flood Problems

Large floods along the Colorado River in the vicinity of the City of Columbus are usually caused by heavy rainfall runoff flows from the watershed area upstream of the portion of the river studied by detailed methods. Such high flows can be the result of frontal storms, hurricanes, or other tropical storms typical to the Texas Gulf Coast region.

2.4 Flood Protection Measures

No flood protection structures exist along the portion of the Colorado River studied by detailed methods.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to

approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding source studied in detail affecting the county.

The flood-frequency discharges for the Colorado River were determined by application of USGS Bulletin 17B procedures to a flood flow frequency analysis of the USGS records for the stream gage at Columbus (Reference 3). Corresponding 100-year flood elevations were interpolated from profiles developed by the COE in a previous report (Reference 4).

A summary of the drainage area-peak discharge relationships for the stream studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
COLORADO RIVER		
At U. S. Route 90	29,009	136,000

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross section data were obtained from several sources, including the Texas Department of Highways, the U. S. Soil Conservation Service (SCS), the Bureau of Reclamation, the War Department, and the Galveston District of the COE.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

Water-surface elevations of floods of the selected recurrence intervals were computed using Manning's formula in accordance with COE Bulletin 1110-2-1409 (Reference 5). The backwater calculations provided the elevation-discharge relationships for a range of discharges for the stream studied by detailed methods.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the stream studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 10 feet (Reference 6).

For the flooding sources studied by approximate methods, the 100-year floodplain boundaries were delineated using the Flood Hazard Boundary Map for the unincorporated areas of Colorado County and the previously printed Flood Insurance Studies for the Cities of Columbus, Weimar, and Eagle Lake (References 7, 8, 9 and 10).

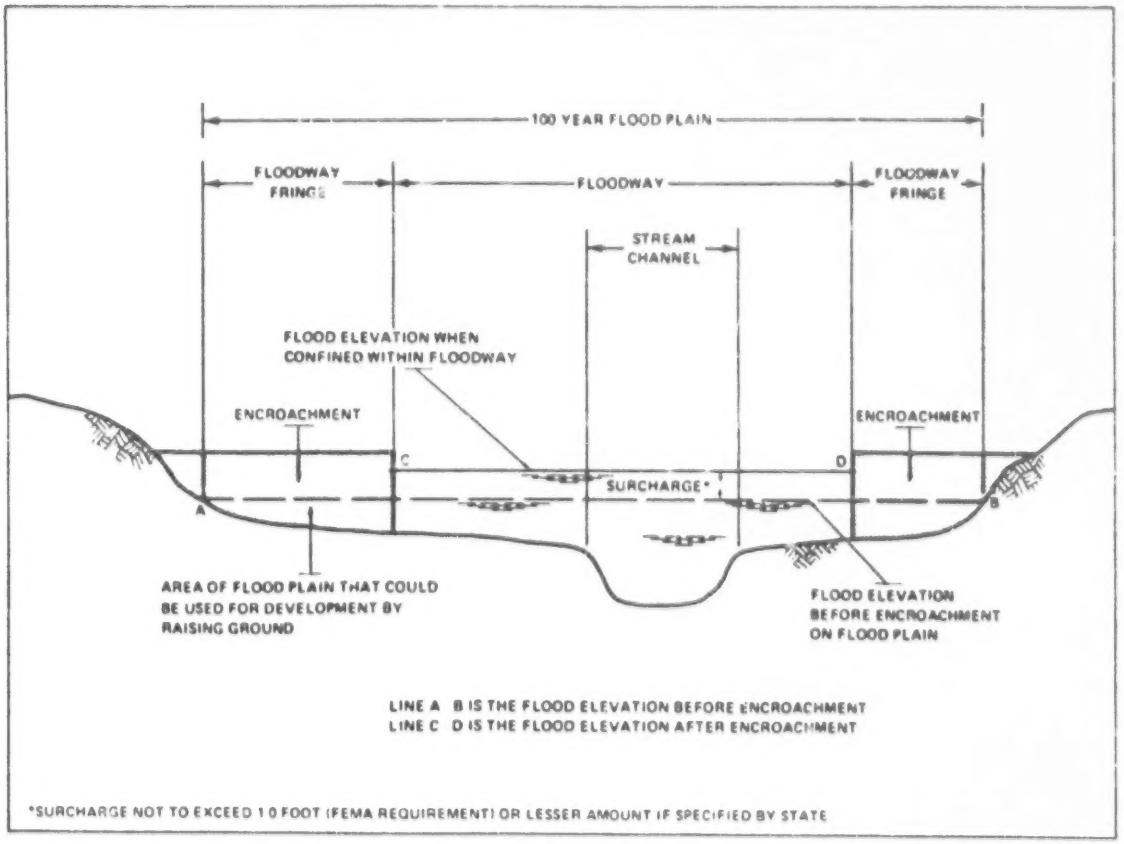
The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program,

a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC Figure 2

No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

The current Flood Insurance Rate Map represents flooding information for the entire geographic area of Colorado County. Previously, separate Flood Hazard Boundary Maps and/or Flood Insurance Rate Maps were prepared for each identified flood-prone incorporated community and the unincorporated areas of the county. Historical data relating to the maps prepared for each community are presented in Table 2, "Community Map History."

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the unincorporated areas of Fayette, Lavaca, and Wharton Counties (References 11, 12 and 13). The results of this study are in agreement with the results of those studies.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
EAGLE LAKE, CITY OF	MAY 10, 1974	APRIL 16, 1976	APRIL 1, 1987	JANUARY 3, 1990
COLUMBUS, CITY OF	FEBRUARY 15, 1974	NOVEMBER 5, 1976	JUNE 19, 1985	JANUARY 3, 1990
WEIMAR, CITY OF	APRIL 29, 1977	NONE	SEPTEMBER 1, 1987	JANUARY 3, 1990
COLORADO COUNTY, UNINCORPORATED AREAS	OCTOBER 25, 1974	APRIL 8, 1977	JANUARY 3, 1990	

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLORADO COUNTY, TX AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

A Flood Insurance Study is currently being prepared for the unincorporated areas of Austin County (Reference 14). The results of that study will be in agreement with the results of this study.

Because it is based on more detailed and up-to-date analyses, this study supersedes the Flood Hazard Boundary Map for the unincorporated areas of Colorado County, and the previously printed Flood Insurance Studies for the Cities of Columbus, Weimar, and Eagle Lake (References 7, 8, 9 and 10).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Federal Regional Center, 800 North Loop 288, Denton, Texas 76201-3698.

9.0 BIBLIOGRAPHY AND REFERENCES

1. The Dallas Morning News, Texas Almanac 1986-1987, (Sesquicentennial Edition).

2. University of Texas, Bureau of Economic Geology, Recent Sediments of Southeast Texas, Austin, Texas, July 1970.

3. U. S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, "Guidelines for Determining Flood Flow Frequency," Bulletin 17B, Reston, Virginia, Revised September 1981.

4. U. S. Army Corps of Engineers, Fort Worth and Galveston Districts, Survey Report on Colorado River and Tributaries, Appendix II, Fort Worth, Texas, March 1966.

5. U. S. Army Corps of Engineers, Bulletin EM 1110-2-1409, Backwater Curves in River Channels, Davis, California, December 1957.

6. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 Feet: Alleyton, Texas, 1958; Bernardo, Texas, 1958; Borden, Texas, 1957; Columbus, Texas, 1957; Ellinger, Texas, 1957; and Frelsburg, Texas, 1958.

7. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Unincorporated Areas of Colorado County, Texas, April 8, 1977.

8. Federal Emergency Management Agency, Flood Insurance Study, City of Columbus, Colorado County, Texas, Washington, D. C., June 19, 1985.

9. Federal Emergency Management Agency, Flood Insurance Study, City of Weimar, Colorado County, Texas, Washington, D. C., September 1, 1987.

10. Federal Emergency Management Agency, Flood Insurance Study, City of Eagle Lake, Colorado County, Texas, Washington, D. C., April 1, 1987.

11. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Fayette County, Texas, Washington, D. C., June 1, 1987.

12. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Lavaca County, Texas, Washington, D. C., September 1, 1987.

13. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Wharton County, Texas, Washington, D. C., April 18, 1983.

14. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Austin County, Texas (Unpublished).

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	135	200.46	Standard disk marked H 817 1943, at Columbus, approximately 1.0 mile northwest along State Route 71 from intersection of U. S. Route 90 and State Route 71, to FM 109 leading to Frelsburg, approximately 0.4 mile north along paved road, and approximately 55 yards east of and across from large 2-story frame house.
RM 2	145	224.90	Standard disk marked K 333 1935, approximately 1.8 miles west along Southern Pacific Railroad from Columbus station, approximately 1.0 mile east from Glidden station, at gravel road crossing, approximately 46.5 feet south of track centerline, approximately 37.5 feet east from gravel road centerline, and flush with ground.
RM 3	145	203.35	Standard triangulation station disk marked COLUMBUS 1943, at southwest corner of Columbus High School playground, approximately 21.3 feet east of west edge of playground, approximately 33.5 feet north of centerline of east-west street, and flush with ground.
RM 4	145	204.44	USGS disk, at Columbus, at U. S. Route 90 bridge over river, in top of south end of west abutment, approximately 13.8 feet south of centerline.
RM 5	145	201.51	Standard disk marked R 815 1943, approximately 0.8 mile east along Southern Pacific Railroad from Columbus station, on U. S. Route 90 bridge, in top of north end of east abutment, approximately 17 feet north of centerline.
RM 6	150	231.81	Standard disk marked M 333 1935, at Glidden railroad station, approximately 119 yards east of east end of station, approximately 78.3 feet south of main track centerline.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (continued)

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 7	150	253.98	Standard disk marked M 818 1943, approximately 0.7 mile west along U. S. Route 90 from railroad station at Glidden, at intersection with gravel road, in top of south end of west headwall of concrete box culvert under gravel road.
RM 8	150	290.42	Standard disk marked N 818 1943, approximately 1.85 miles west of Glidden railroad station along U. S. Route 90, in top of east end, south headwall, concrete box culvert under highway.
RM 9	150	305.37	Standard disk marked P 818 1943, approximately 2.75 miles west from Glidden railroad station along U. S. Route 90, in top of west end of north headwall of concrete box culvert under highway.
RM 10	150	277.40	Standard disk marked Q 818 1943, approximately 3.75 miles west along U. S. Route 90 from railroad station in Glidden to concrete box culvert under highway, in top of east end of south headwall.

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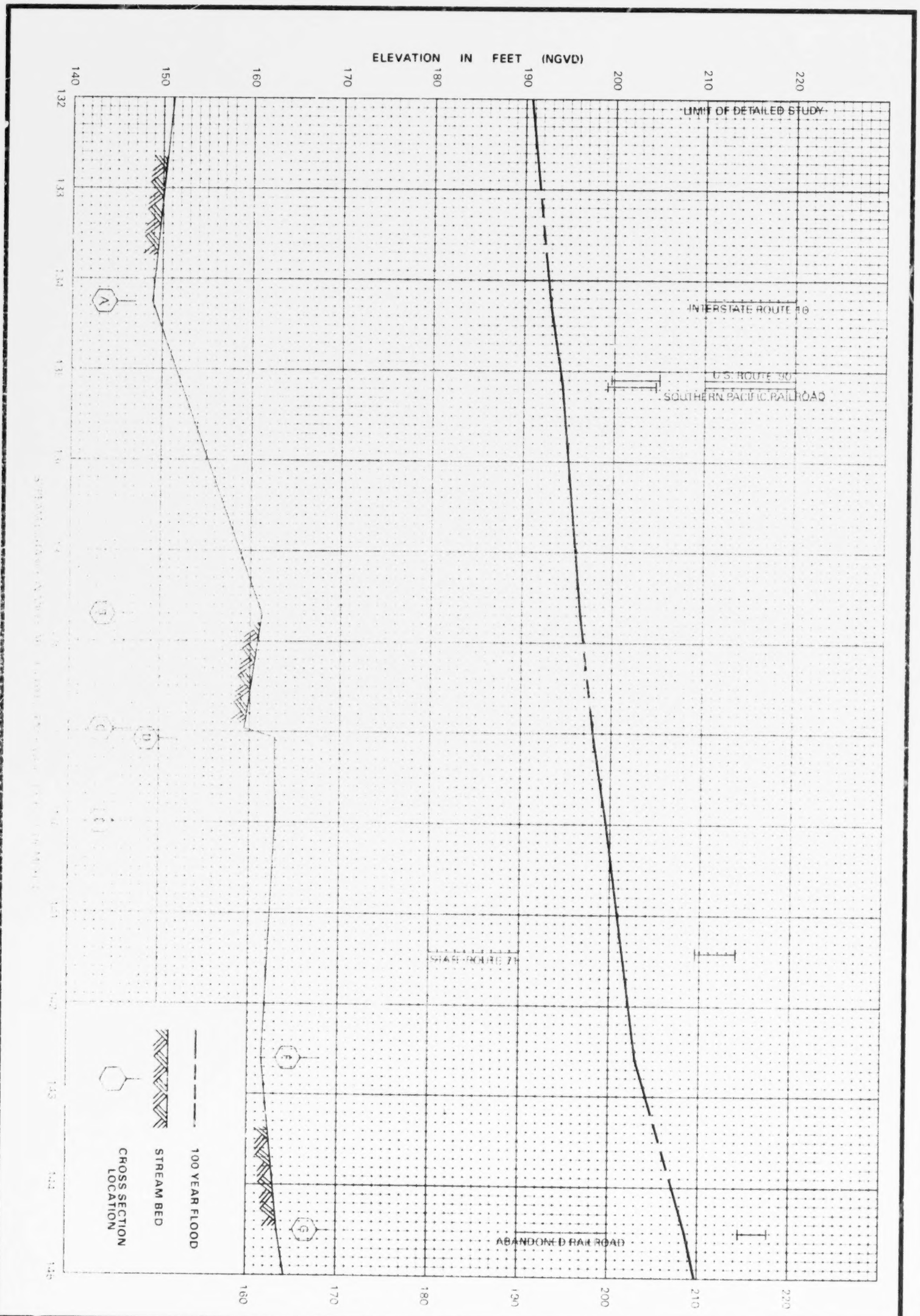

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLORADO COUNTY, TX
AND INCORPORATED AREAS

FLOOD PROFILES

COLORADO RIVER

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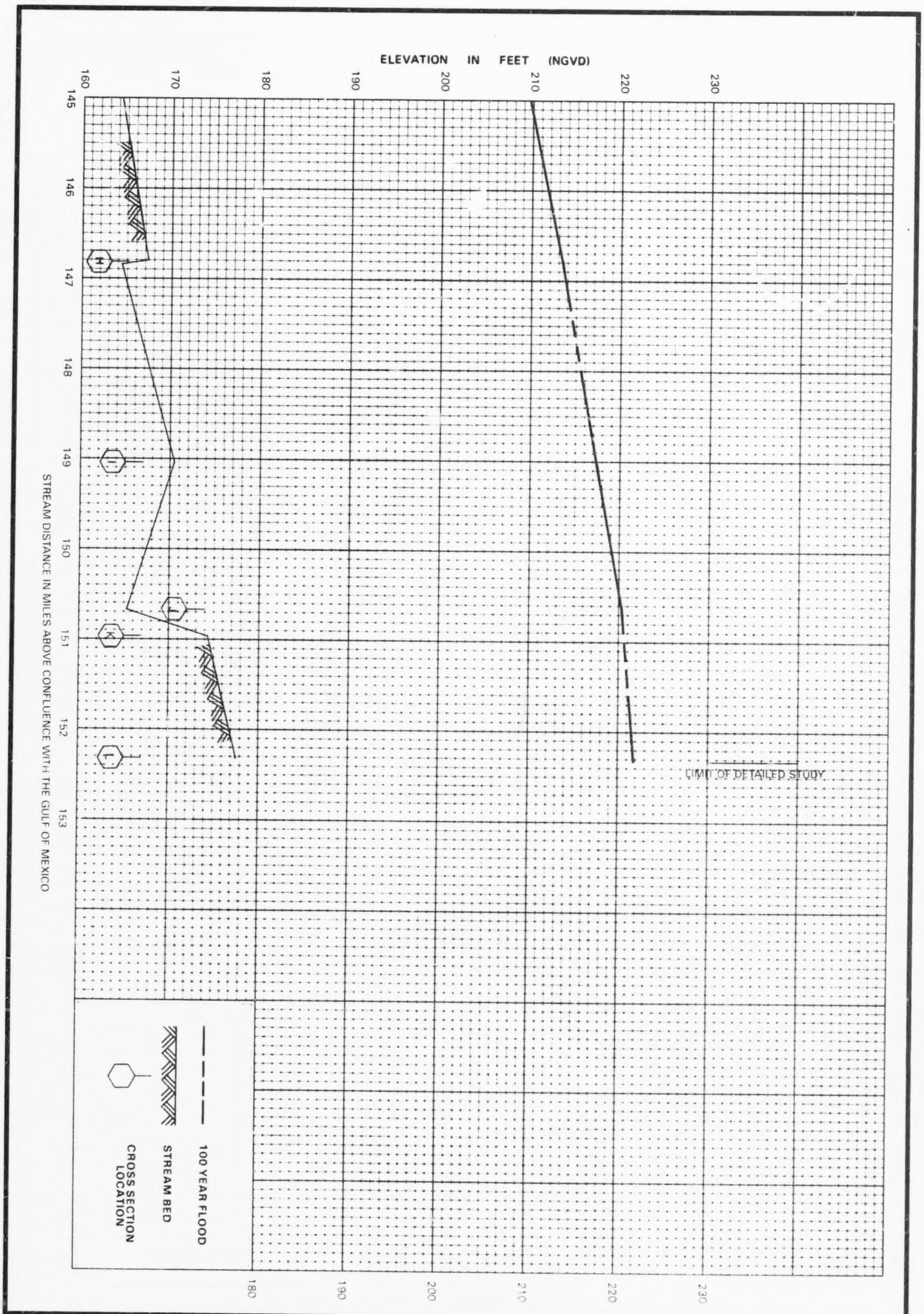

FEDERAL EMERGENCY MANAGEMENT AGENCY

COLORADO COUNTY, TX
AND INCORPORATED AREAS

02P

FLOOD PROFILES

COLORADO RIVER